Watch case

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Equivalents:	

Abstract

950,127. Watches. SCHLUP & CO. Ltd. Nov. 28, 1961, No.42531/61. Heading G3T. In a watch case the bezel 1, Figs. 1 and 2, is made of a hard metal carbide, such as a sintered tungsten or titanium carbide powder, which is harder than topaz. The bezel is fixed by a glue to the stainless steel caseband 12 which receives the case bottom. Complementary cylindrical surfaces 8 are provided in the bezel and case- band. The glass 3 is retained by a ring within a flange of the caseband. In another example the bezel is of stainless steel but is provided with a surface layer comprising two plates of a hard metal carbide such as tungsten or titanium. In another example, Fig. 7, the watch case 30 is of the hard metal carbide and has scale markings 35.

Description

COMPLETE SPECIFICATION Watch Case We, SCHLUP & Co., LTD., of Bielstrasse 43, Lengnau, Switzerland, a company limited by shares duly organized under the Laws of Switzerland, do hereby declare the invention, for which we pray a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:- This invention relates to watch cases and in particular to wristwatch cases having a fine appearance.

The finest watch cases known in the art are made of gold and they are sometimes even furnished with enamel. These known watch cases are however very expensive and they have, moreover, to be carried with outmost care. Therefore, they would very soon be damaged, if they were carried in everyday life for manual labour or sport.

The only way hitherto known in the art for obtaining a watch case resistant to rough conditions or wear was to make it of steel and in particular of stainless steel. However, if such a watch case is repeatedly submitted to frictional engagement with hard objects, its finely polished outer surface portions exposed to contacts with foreign objects will soon be scratched and the watch case will thus suffer a substantial damage.

It is therefore an object of the invention to provide a watch case with an outer portion reinforced in such a manner that the likelihood of suffering injury by impact or frictional engagement with hard foreign objects is substantially reduced.

It is also an object of the invention to provide a watch case with a reinforced outer portion resistant to the oxidizing agents of the atmosphere.

Another object of the invention is to provide a watch case with a protecting outer area having a very fine durable appearance. According to the present invention there is provided a watch case comprising an outer portion which in use surrounds the face of the watch said outer portion consisting of a material containing a hard metal carbide being harder than topaz, such as a sintered tungsten or titanium carbide powder.

Metal carbides such as tungsten or titanium carbides are well known for their extreme hardness and they have accordingly been used hitherto for tools on an important scale. Till now, nobody has however imagined that workpieces of common use could be manufactured on a commercial scale with such a material. This is probably due to the fact that a material containing a tungsten or titanium carbide can only be machined with the greatest difficulty after it has been sintered. Diamond is indeed the only material by means of which particles can be removed from a workpiece made of a sintered tungsten or titanium carbide powder and even with a grinding wheel loaded with diamond powder, the amount of material which can be removed from such a workpiece during a reasonably long period is ridiculously small. Furthermore such a machining operation would involve too strong a wear of the grinding wheel. By means of electric sparks produced in a cell like those used for electrolytic polishing a noticeable amount of material can be removed from a workpiece consisting of a sintered tungsten or titanium carbide, but this method is very slow and can therefore only be resorted to with the manufacture of tools, the high cost price of which will be compensated by the great number of workpieces it will be possible to manufacture by means of these tools.

To form a piece of a material containing tungsten or titanium carbide, an intimate mixture is first prepared, for instance in a

ball mill, with a powder of the metal carbide and a powder of a bonding metal such as for instance cobalt, the particles of both powders thereby having very small sizes. This mixture is then submitted to a preliminary sintering so as to form a solid block which can however still be machint-d easily, for instance by means of a diamond tool. Pieces having a shape similar to that of the workpieccs which are to be manufactured are then cut from said block and introduced into a furnace to carry out the final sintering themof. During the last operation a shrinkage of about 20^; by volume can be observed. After this operation the pieces obtained receive their final hardness. Because of the amount of shrink-.- observed, it did not appear very easy to form workpieces of hard metal with exact sizes by the method described. For the s2me reason it was also considered that workpieces of tungsten or titarduin carbide formed by sintering should have ov_rall the same cross-section to prevent the shrinkage from being accompa=-ii; d by a distortion. The above mentioned reasons are probably those which till now kept manufacturers from making tungsten or titanium carbide workpieces of common use on a commercial scale and in particular from making watch cases of a sintered hard metal. Watch cases must of course have exact inner sizes and their cross-section varies between wide limits beta use of the wristband attaching lugs which have to be made integral with the case.

In spite of all the existing very strong prejudices against the idea of manufacturing watch cases of hard metal carbides, it 1s now been observed that these pieces, despite their substantially varying cross-section, can be made on a commercial scale without great difficulties and with a quite satisfactory precision. To avoid distortions in sintering, the pieces are laid on a crucible, for instance of graphite, and a small weight is set thereupon.

The invention will now be dccscribed in detail with reference to the accompanying drawings which constitute a diagrammatical showing of three embodiments of the invention, which are however only disclosed by way of example.

In the drawings: Fig. 1 is a perspective view of the first embodiment, Fig. 2 is a part sectional view on a larger scale of the watch case represented in Fig. 1, Fig. 3 is a bottom view of a portion of said watch case, Fig. 4 is a side view partly in section of tile watch case portion represented in Fig. 3, Fig. 5 is a perspective view analogous to that of Fig. 1 showing the second embodiment, Fig. 6 is a part sectional view on a larger scale of this second embodiment, and Fig. 7 is a persp.ctive view of the third embodiment.

The watch case of the first embodiment comprises an outer portion 1 of hard metal consisting of a sintered tungsten carbide powder. This portion 1 is represented separately in Figs. 3 and 4. As shown in Figs. 1 and 2 this outer portion 1 constitutes the upper portion of the watch case, i.e. the portion which is particularly exposed to wear by coming in contact with foreign bodies. The watch case outer portion 1 is provided with a polished upper inner flat annular surface area 2 surrounding the watch glass 3. Portion 1 also comprises a polished upper outer conical surface area 4 adjacent surface area 2 and extending downward therefrom. The two surface areas 2 and 4 constitute the upper metallic surface of the watch case and therefore the most important part of the visible outer area thereof. Portion 1 further comprises an outer side surface extending dosvn:vard from the periphery of surface area 4, in a direction substantially parallel to the watch case axis. It can be noticed in Fig. 1 that this side surface comprises two areas each extending on one of the lo_iger sides of the watch case and having substantially the same overall width. Fig. 1 also shows that said side areas not only extend over the watch case part adapted to only the watch movement but also along projections 5 which serve as wristband attaching lugs. As viewed #n Fig. 3 portion 1 comprises two pairs of lugs 5 extending in diametrically opposed directions from the centre of said portion. A half cylindrical recess 6 is formed in one of the loner sides of portion 1 to serve as lodging for the winding and hand setting crown 7. The inner surface of portion 1 comprises three cylindrical bearing surfaces 8 which are separated from one another by too flat shoulders 9. Portion 1 finally comprises two web sections 10 each extending over the two lugs of one of said pairs and con- nectir#.g these two lugs to one another. As shown in Fig. 1 the upper surfaces of web sections 10 form part of the conical upper surface area of portion 1. As more precisely explained hereinafter these web sections 10 are intended for avoiding a distortion of portion 1 in sintering.

To manufacture the watch case outer portion 1, a preliminary sintered block of tungsten carbide is first prepared as explained above. A piece having a shape similar to that of Fig. 1 is then cut out of that block by the usual techniques. This cutting operation can be carried out by means of a diamond tool without excessive wear of said tool, because the preliminary sintered block has not yet received its final hardness. The shape of the piece cut out of said block has to be

calculated with respect to that of portion 1 while considering the shrinkage of about 20 /, by volume, which the preliminary sintered piece will be subjected to during the final sintering operation. To avoid a distortion of this piece during the final sintering operation, it is recommended to lay said piece on a crucible having a conical surface and preferably made of graphite, the conical surface of the crucible thereby having the same opening angle as the conical surface area 4 of portion 1. Moreover, the workpiece will have to be pressed on said crucible by means of a weight set on the thick parts of portion 1 represented in Fig. 3. After the sintering operation the portion obtained will only have to be submitted to a usual polishing operation of its upper surface comprising areas 2 and 4. This polishing operation can be carried out without any difficulty because of the simple geometrical from of areas 2 and 4.

To enable attaching a wristband to the watch case according to the invention, blind holes 23 are provided by means of a usual machine well known to those skilled in the art in the inner face of lugs 5, before portion 1 has been finally sintered. Usual bars 11 can then be mounted on portion 1 in the same manner as with known watch cases.

To manufacture a watertight watch case comprising a screwed bottom section, it is not advisable to make the whole case-band of hard sintered metal, since it would not be possible to provide screwthreads in such a piece. The watch case represented in Figs. 1 and 2 therefore comprises an inner metal ring preferably made of stainless steel 12. A lodging 13 adapted to receive the glass 3, a shoulder 14 serving as abutting stop for the dial 15, a second shoulder 16 similarly serving as abutting stop for the base-plate of the watch movement 17, grooves 18 adapted for receiving latches (not shown) provided for fixing the watch movement 17 within ring 12, a lodging 19 adapted for receiving an outer cylindrical portion of the watch case bottom 20, and a lodging 21 adapted for receiving a gasket 22 provided for ensuring a watertight seal between ring 12 and bottom 20, are provided in the inner surface of ring 12. Cylindrical bearing surface portions corresponding to the surfaces 8 of portion 1 and flat shoulders corresponding to shoulders 9 of portion 1 are machined on the outer surface of ring 12.

The outer protecting and ornamental portion 1 and the metal ring 12, adapted for receiving and supporting the glass 3, the watch movement 17 and the bottom 20, are rigidly fixed to one another, portion 1 thereby extending above and around ring 12. To fix portions 1 and 12 to one another, the latter could be set with force fit into the former. To compensate the unavoidable manufacturing imprecisions, in particular of por- tion 1, it is however more advisable to glue said two portions into one another, for instance by means of the glue put on sale under the trademark "ARALDITU'. The glue layer extending between the corresponding cylindrical bearing surfaces and the corresponding shoulders of both portions 1 and 12 will thereby not only ensure the fixation of said portions to one another but also automatically compensate the manufacturing imprecisions thereof.

Fig. 2 shows that the glass 3 is formed with a lower bulged surface and with an upper flat surface. To obtain a watertight

seal between glass 3 and ring 12, a downwardly extending rim of glass 3 is pressed in a radial direction against a cylindrical surface of ring 12 by means of a strengthening ring, as usual. The depth of lodging 13 is thereby chosen in such a manner that the flat upper glass surface will be located somewhat below the inner upper flat surface area 2 of portion 1, when the glass 3 and the portion 1 will have been set in place on to ring 12. Portion 1 will thus not only protect the watch case metal sections, but also the glass of this watch case.

In addition to the fact that the inner metal ring 12 can be manufactured very easily, for instance on an automatic lathe, this ring has also the advantage that it constitutes a resilient cushion for portion 1, to reduce the likelihood of breaking said portion upon a strong impact.

The watch case according to the second embodiment (Figs. 5 and 6) differs from that of the first embodiment by the fact that the outer portion of the watch case is here protected by means of hard metal elements having a different shape from the first embodiment. The watch case represented in Figs. 5 and 6 comprises an annular piece 24 preferably made of stainless steel and having only its upper surface areas covered and protected by thin plates 25 and 26 of a sintered tungsten carbide. The annular puce 24 is provided with two pairs of lugs 27, 28 projecting in two diametrically opposed directions from said annular piece and integrally made therewith. As in the first embodiment lugs 27, 28 permit attaching a wristband 29 to the watch. To permit fixing the hard metal plates, the piece 24 has a flat upper surface and the upper surface of each lug comprises a first flat area located in the same plane as said flat upper surface of piece 24, and a second area inclined downwardly with respect to said first area. Moreover, the second areas of the two lugs of the same pair are located in the same plane. Plate 25 comprises an annular portion 25a and two diametrically opposed ears 25b projecting from said annular portion. This plate 25 has the same overall thickness, so that manufacturing plate 25 does not present any

difficulty. The sizes of plate 25 are calculated so that said plate will entirely cover the upper surface of the annular portion of piece 24 as well as said first flat upper surface areas of lugs 27 and 28. Two plates 26 are further fixed over the inclined upper surface areas of lugs 27, 28, respectively. Plates 26 can furthermore be so arranged that they can be set at the side of plate 25, while avoiding any apparent joint therebetween. Plates 25 and 26 are preferably fixed to their supports 24, 27, 28 by soldering. Since plates 26 also have the same overall thickness, they can be manufactured by sintering without any difficulty.

As in the first embodiment, the stainless steel support 24, 27, 28 of the hard metal plates 25, 26 constitutes a resilient cushion preventing said plates from breaking upon an impact. Since plates 25 and 26 have the same overall thickness, their upper visible surfaces can be polished together before soldering these plates on piece 24. After the soldering operation, which can be carried out under a controlled atmosphere by passing the pieces through a furnace, on a continuously driven endless band, the watch case described only requires a short finishing operation to burnish their polished surfaces.

Instead of providing the watch case only with a reinforced outer portion consisting of a hard metal carbide, it could also be made entirely of said hard metal carbide as shown in Fig. 7. In this third embodiment the watchcase comprises a massive piece 30 of sintered metal carbide having a substantial rectangular shape. Piece 30 is provided with a central circular lodging adapted for accomodating a watch movement therewithin. Two recesses 31 are also provided in the two shorter sides of piece 30 to enable attaching a wristband 32 to that piece. A bore (not shown) is finally provided across a longer side portion of piece 30, to ensure the passage of the winding and hand setting stem carrying crown 33. The upper visible surface of piece 30 is flat. This surface area is wider and longer than the glass 34 secured to piece 30. The upper surface of piece 30 can be polished in the usual manner, by means of a grinding wheel leaded with a finely divided diamond powder. Markings 35, extending in a radial direction with respect to the central circular opening of piece 30 and corresponding to the horal divisions of the dial, are provided in the upper surface of piece 30. These markings can be engraved with a pointed diamond tool before the final sintering operation. The two longer side surface areas of piece 30 are also flat, so that they can easily be polished after the final sintering operation.

The cost price of the watch cases according to the invention is obviously higher than that of the stainless steel watch cases known in the art. This price is however substantially lower than that of gold watch cases.

The hardness of the material obtained by sintering a tungsten carbide powder is about 9 in the Mofascale. Said material is thus harder than topaz, which is set at 8 in the Mohs'scale. Sintered tungsten carbide can even be as hard as carborundum, which has a hardness of about 9.5 in said scale. A piece made of sintered tungsten carbide will therefore not be scratched by the usual materials. Only diamond and, in some instances, carborundum are able to scratch such a piece. Moreover, tungsten carbide has the advantage that it is resistant to the oxidizing action of the corrosive agents of the atmosphere.

The improved watch case according to the invention has thus tile advantage that it will keep its original appearance during an almost limitless period, even if it is worn in the roughest conditions. Its polished outer surfaces will tend always to show the same brightness and they will hardly ever be injured by scratches.

The watch cases according to the invention can also be given new shapes comprising large polished visible surface areas.

The colour of the material consisting of sintered tungsten carbide is darker than that of steel, thus giving the watch case according to the invention an original ornamental appearance.

Instead of using tungsten carbide to form said outer portion of the watch case according to the invention, other metal carbides being about as hard as tungsten carbide, such as for instance titanium carbide, could also be resorted to.

Although some embodiments of the invention have been described in detail with refer- epce to the accompanying drawings, various changes in the shape, sizes and arrangement of parts will be apparent to those skilled in the art within the scope of the appended claims.

950127 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

Fig. 1

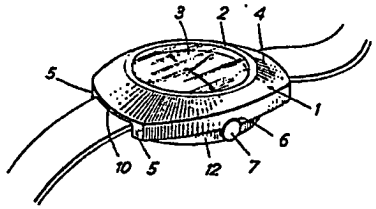

Fig. 2

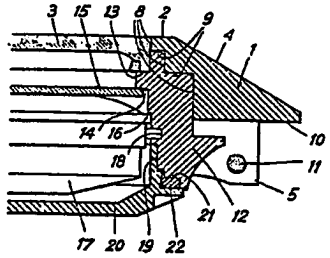

Fig. 3

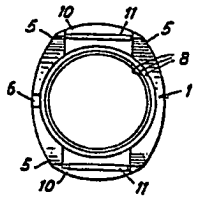

Fig. 4

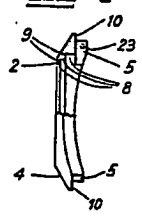

Fig. 5

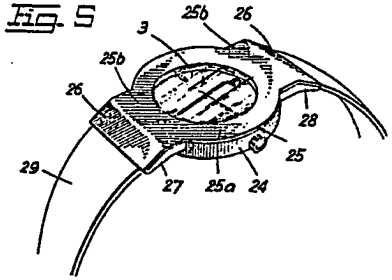

Fig. 6

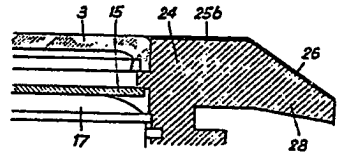

Fig. 7